UNIVERSITY OF GONDAR

FACULTY OF VETERINARY MEDICINE

COPROLOGICAL EXAMINATION OF HAEMONCHUS ON SMALL RUMINANT IN DANGILA DISTRICT, AWI ADMINSTRITIVE ZONE, NORTH WEST ETHIOPIA

BY

GETANEH ENDALEW YAZIE

JUNE, 2015

GONDAR, ETHIOPIA

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COPROLOGICAL EXAMINATION OF HAEMONCHUS ON SMALLRUMINANTS IN DANGILA DISTRICT, AWI ADMINSTRITIVE ZONE, NORTH WEST ETHIOPIA

A thesis submitted to faculty of Veterinary Medicine, for partial fulfillments of the requirements for degree of the Doctor of Veterinary Medicine

DVM THESIS

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LISTS OF ABBRVIATIONS

AADS	Amino aceoitrile derivative
CSA	Central statistical authority
FEC	Fecal egg count
GABA	Gamma-aminobutyric acid
GIN	Gastro intestinal nematodes
Hb	Haemoglobin
L	Larva
χ^2	Chi-square
C^o	Degree centigrade

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ABSTRACT

A cross-sectional study was carried out from November 2014 to April 2015 to determine the prevalence and associated risk factor of haemonchosis in randomly selected sheep and goat in Dangila district, Awi adminstritive zone, northwest Ethiopia. Fresh faecal samples were collected from 384 randomly selected sheep (n=296) and goats (n=88). Coprological examination for the detection of haemonchus eggs was performed using floatation technique. The overall prevalence of haemonchus in both species of animals was 53% (204/384). At species level, 55% (164/296) sheep and 45% (40/88) goats were found positive. There was no statistically significant (χ^2=3.536, p=0.171) difference observed between the two species. Similarly, the prevalence of haemonchus infection in related with age were 62% animals $\leq$2 years, 58% which was included in 2- 4 years and 41% animals $\geq$4 years old. Moreover, there was a statistically significant (χ^2=13.198, p=0.001) difference observed among the three age categories while there was statistically insignificant (χ^2=2.31, p=0.128) difference in males 48% (74/153) and in females 56% (130/231). In addition, the prevalence of haemonchosis in poor body condition was high (58%) in relative to good (48%) and medium (53%) in the study area. However, there was no statistically significant (χ^2=2.43, p=0.297) variation observed. Furthermore, concerning the relationship between place of origin and haemonchosis were statistically significant (χ^2=6.88, p=0.033) and the prevalence of haemonchosis was high in Kuandisha (62%) as compare to Girarigae(49%) and Ganga (48%). This study suggested that the high rate of infection with haemonchus could contribute to low performance and life expectancy of small ruminants in the region. The current finding also revealed that significant numbers of sheep and goats were affected by haemonchus parasites and a higher infection rate was observed in animals $\leq$ 2 years than above 4 years of old. Hence, strategic de-worming with good husbandry practice should be implemented.

Key words: Coprology**,** Dangila, Floatation, Goat, Haemonchus, prevalance, Sheep

INTRODUCTION

Sheep and goats, requiring little inputs, play vital role in rural economy through provision of meat, milk, blood, cash income, accumulating capital, fulfilling cultural obligations, manure, and contribute to the national economy through the export of live animals, meat and skins (Amenu, 2005). Helminth infections in domestic ruminants are major importance in many agro-ecological zones in Ethiopia and had the highest index as an animal health constraint to the poor keepers of livestock worldwide through losses due to reduced weight gains and growth rate, reduced nutrient utilization, lower meat, wool and milk production, involuntary culling, cost of treatment and mortality (Central Statistics Authority, 2004). Gastrointestinal nematodes are recognized as a major constraint to both small and large-scale small ruminant production in developing countries, leading to significant economic losses (Fritsche,1993).The abomasal nematode *Haemonchus contortus* is particularly important and causes severe anaemia and death in severely infected animals Review of the available literature in Ethiopia strongly suggests that helminthosis has nationwide distribution and is also considered as one of the major setbacks to livestock productivity incurring huge indirect and direct losses in the country(Hansen, 1994).

In rural and semi-rural regions livestock represent the pillar of the economy and plays a vital role in livelihood of the farming communities (Jacquiet, 1995).Of the endoparasites, the abomasal nematode *H. contortus* is incriminated as the dominant cause of parasitic gastroenteritis and exerts a severe economic toll in sheep and goats (Krecek, 2006). The severity of the disease depends on a variety of factors, including the number of helminthes infecting an animal intensity of the infection. Several factors are involved in the pathogenesis of haemonchosis. In terms of the development of disease, the most important factors are parasite virulence and host response. The main pathogenic mechanisms of *H. Contortus* are a direct lesion on the gastric mucosa and haematophagy.

Ovine haemonchosis occurs in three forms: pe racute, acute, and chronic .The per acute form is less common and the infected lambs may die suddenly from severe haemorrhagic gastritis. Lambs and young sheep are commonly affected by the acute form of the disease ,in which animals are found dead without showing over clinical signs (Fayza *et al.*, 2003).The prevalence of gastrointestinal nematodes (GIN) in tropical and subtropical areas has adversely affected the production potential of sheep leading to countless deaths and insidious economic losses in livestock sector. Among (GIN), *H. Contortus* is considered the main culprit causing anaemia and hypoproteinaemia in ruminants (Chaudary *et al.,* 2007). Even though the economic significances and prevalence of haemonchus is high there was no previously reported and documented study in the study area. Therefore, the major objectives of this study were:

- To determine the prevalence of small ruminant haemonchosis in Dangila district
- To assess the associated risk factors of small ruminant haemonchosis in the study area

2. LITERATURE REVIEW

2.1. Etiology

Haemonchosis is a serious parasitic disease of domestic and wild animals in the tropics caused by the genus Haemonchus (Fabiyi, 1987). *Haemonchus contortus* is the species that most commonly infects sheep and goats and to a lesser extent bovine and cameline species (Fayza *et al.*, 2003).

2.2. Taxonomic position

Haemonchus is taxonomically classified as, Kindom, *Animalia*; Phylum, *Nemathelmintes*; Class, *Secernetea*, Order *Strongylida*; Suborder, *Trichostrongylina*; Superfamily, *Trichostrongyloidea*; Family, *Haemonchidae*; Subfamily, *Haemonchinae*; Genus, *Haemonchus* and Specie, *H. Cotortus* (Francisco *et al*, 2007). The genus haemonchus apparently originated in Africa, with an initial diversification in antelopes and subsequent colonization and development in other wild ruminants (francisco *et al.*, 2007). There was independent colonization, in domestic ruminants later; human migrations enabled the spread of *haemonchus* to wild and domestic ruminants in other continents and in sheep as well. In addition, eleven more species have been described in the genus which includes *H. semilis*, *H. longistipes*, *H. placei*, *H. Bedfordi*, *H. mitchelli*, *H. vegliali*, *H. lawrencei*, *H. okrugeri*, *H. horak*, *H.* d*innik*. Moreover, hybrids of *H. contortus* and *H. placei* have arisen. (Francisco *et al*., 2007).

2.3. Morphology

An adult *Haemonchus contortus* measures about 25 to 34 mm long, the male being shorter than the female which measure about 19 to 22 mm, the morphological characteristics of *Haemonchus contortus* are a mouth capsule with a single dorsal lancet and two prominent cervical papillae in the oesophageal area (Rseta, 2004). The male parasite is characterized by its copulatory bursa formed of two large lateral lobes and a small asymmetrically positioned dorsal lobe. Together with the two chitinous spicules, which are inserted in the female genital opening during copulation, this part of the worm is important for identification. The females have a reddish digestive tube filled with ingested blood, spirally surrounded by two white genital cords (ovaries). They have a sharply pointed slender tail and a vulva with or without anterior vulval flap (Eseta, 2004).

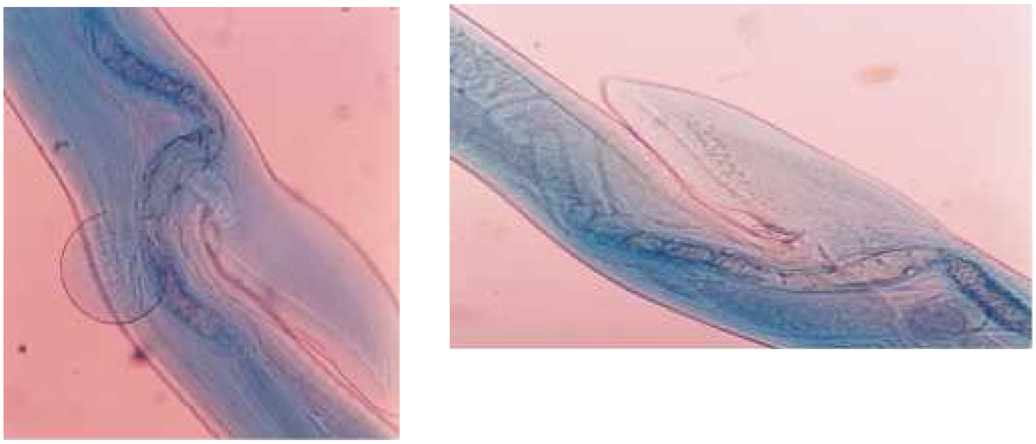

Figure 1: Vulvar morphology and sympatry of *Haemonchus* species in naturally infected sheep and goats (Kumsa *et al.*, 2007)

Figure 2.The vulvar morph types of female *Haemonchus* in sheep and goats (Kumsa *et al*., 2007)

2.4. Geographical distribution

Haemonchus contortus infestation occur throughout the world; epidemiological studies describe the lower environmental limits for haemonchosis to occur in sheep and goat, as being a mean monthly temperature of 18ºc and approximately 50 mm rainfall. Thus it has been generally recognized that *Haemonchus contortus* is a problem parasite restricted to the warm, wet countries where sheep and goats are raised. However, recent evidence shows that this parasite is apparently common even in northern Europe (chandrawathani and waller., 2005).

2.5. Life Cycle *Haemonchus contortus*

The life cycle of *Haemonchus contortus* is direct. The females are prolific egg-layers frequently laying 5000-10,000 eggs a day per female in a few hours, eggs embryonate and hatch into the stage (L_1) larvae. The L_1 larvae feed on faecal microflora, develop, grow and moult to the second stage (L_2) larvae. After a further period of activity and growth, the third stage (L_3) is achieved. The third stage larvae fail to cast off the cuticle of the previous stage and are ensheathed, non-feeding form. Under favorable conditions, the infective stage will be present on the pasture within 4-6 days but may be delayed for weeks or months under cool conditions. The sheathed infective larva is resistant to desiccation and freezing. The larvae disperse from the faecal mass onto herbage, while moisture is adequate; they survive until they invade the host. Infection of trichostrongylids is usually via the oral route. After ingestion, the larvae exsheath in the rumen and migrate to abomasums, the actual stimuli to exsheathment are unknown but are thought to be dissolved carbon dioxide and / or undissociated carbonic acid in the gut. The parasitic exsheathed (L_3) migrate to the abomasum and become closely associated with the mucosa, where the third molt occurs and the fourth stage (L_4) larvae emerge. The (L_4) is able to feed once the (L_3) sheath is lost and, just before the time of the fourth molt, the piercing lancet which enables the larvae penetrate the surface of the abomasal mucosa develops. Feeding commences and is soon followed by the fourth molt to the fifth or pre-adult stage. After further feeding, the fifth stage larvae mature into adult worms which are to be found moving freely on the surface of the mucosa. Differentiation into male and female begins around the time of the fourth molt. They reach maturity in 15 days, the first eggs appearing in the faces of the host about 15 days after infection (Rugutt, 1999).

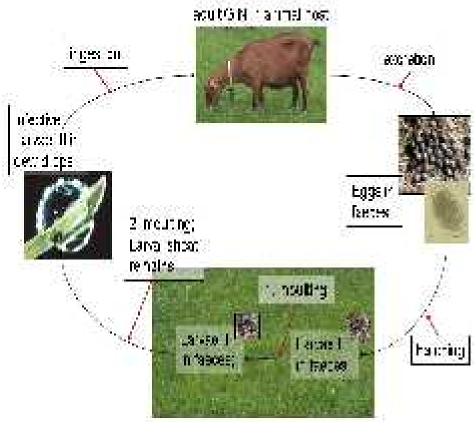

Figure 3**:** General life cycle of gastrointestinal nematodes of small ruminants (courtesy of Scheuerle, 2009).

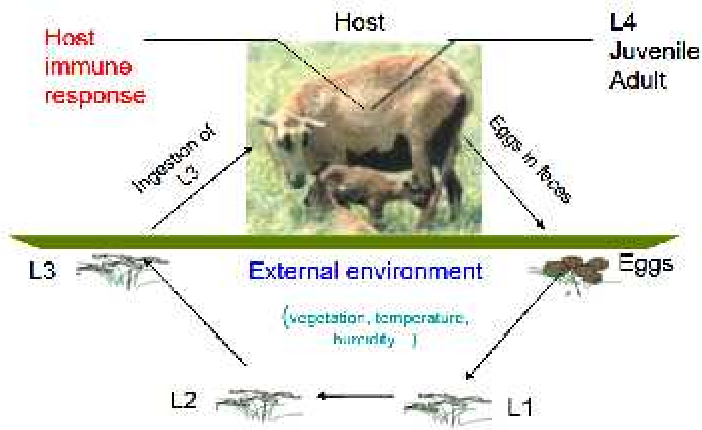

Figure 4: Schematic representation of the life cycle of *H. contortus* in sheep (courtesy of Terefe, 2009).

2.6. Hypobiosis phenomenon

An important phenomenon observed in the life cycle that has epidemiological implications is “arrested larval development” or “hypobiosis”. Hypobiosis is the “temporary cessation of development of a nematode at a particular point in its parasitic development” it is usually due to an unfavorable environmental stimulus, such as cold weather or dry conditions, received by the free-living L_3 prior to ingestion and usually coincides with onset of winter or very dry conditions. Other parasitic and host factors are involved such as blood group, breed of sheep may play role (Soulsby, 1982). Arrested development can occur in the gut of sheep or on pasture and ensures survival of the nematode under adverse climatic conditions, subsequent maturation of the larvae due to resumption of development known as the ‘spring rise’, when favorable conditions return in the spring, leads to a rapid rise in infection levels or fecal egg counts in the sheep (Hima, 2004).

2.7. Pathogenesis

Several factors are involved in the pathogenesis of the haemonchosis. Interms of the development of disease, the most important factors are parasites virulence and host response. The main pathogenic mechanism of *Haemonchus contortus* are a direct lesion on the gastric mucosa and hematophagy. The effects of pathogenic mechanisms during intra-host parasite development and the subsequent response of infected ruminants provoke morpho-functional changes, particulary in the abomasums; also variation appears in some blood parameters, resulting in the appearance of both anaemic and impaired digestion – absorption syndrome. In goats; the mixed infection with *Haemonchus contortus* and *Eimeria species* showed; the abomasums of infected animals were congested and the intestine was thick. The spleen, liver, intestines and kidneys were ischemic. Moreover, petechial hemorrhage and purulent exudates was seen in the bronchioles and lobules of the lungs, gelatinous exudates was seen in the interlobular septate (Siham *et al*., 1997)

2.8. Immunology

Both humoral and cellular arms of the mammalian adaptive immune system are actively involved in response to haemonchosis, generally, t-lymphocytes, soluble cytokines, b-lymphocytes, plasma cells, various immunoglobulin isotypes, mast cells, eosinophils and globule leukocytes are known to actively take part in immunological reactions, although variability in their production and magnitude of action in different species of parasite and host has been observed. The ultimate result of parasitic invasion of a host animal is either establishment of infection or expulsion of the invading parasite. The latter being the consequence of protective immune response of the host (Krishna, 2007).

2.9. Self-cure phenomenon

The most frequent described protective immune response against the abomasal nematode *Haemonchus contortus* in sheep is the self-cure reaction. The Self-cure reaction was considered as first evidence of immune expulsion of gastrointestinal nematodes. Sheep and goats infected with *Haemonchus contortus* when allowed to graze in contaminated pasture showed suppression of egg production within a few days. However, these suppression of eggs often accompanied by elimination of adult worms and by a strong epidemiological re-infections. Self cure reaction was the most protective immune response against abomasal nematodes (Fayza, *et al*., 2003). This reaction is depends on antigens associated with the living larvae and which act locally. Both host and parasite genetic factors may influence the occurrence of the self cure reaction. Self-cure is accompanied by a transient rise in blood histamine, an increase in the complement- fixing antibody titer and intense mucosal oedema in the abomasums (Soulsby, 1982).

2.10. Clinical manifestations and signs

Haemonchosis in sheep and goats may be classified as hyperacute, acute, or chronic. In the hyperacute form, death may occur within one week of heavy infection without significant signs. This form of the disease is very rare and appears only in highly susceptible lambs and kids. The acute form is characterised by severe anaemia accompanied by oedema ("bottle jaw"). Anaemia is also characteristic of the chronic infection, often of low worm burdens and is accompanied by progressive weight loss. The chronic form is the most commonly observed during natural infections. The lesions are associated to anaemia resulting from blood loss, with the exception of the L3, all other stages of development feed on blood, *Haemonchus contortus* is known to produce calcium and a clotting factor binding substance known ascalreticulin, enabling the parasite to feed easily on host blood (Getachew *et al*., 2007).

2.11. Advanced diagnosis:

Faecal examination considered as one way to determine the species of nematodes infecting sheep and goats. Standard parasitological technique will be used for faecal examination (Anon, 1977). Then culture the nematode eggs to obtain the infective third stage larvae to carry out more specific identification with the aid of special characteristic features of each species of parasite. These larvae can be identified by a combination of characters such as the length and shape of tail, assisted by the total body length and by certain head and tail characteristic (Anon, 1977). Moreover, when outbreak of helminthosis occurs, the diagnosis could be confirmed by performing postmortem examination or sacrifice one of the severely infected animals with poor bodily condition. Identification of the parasite present in the gastrointestinal tract together with the gross changes encountered at the necropsy will enable diagnosis of the condition. In case of ovine haemonchosis, the presence of large numbers of adult *H. contortus* in the abomasum is accompanied with anaemia and sub mandibular oedema (bottle jaw), hypoproteinaemia and reduction in hemoglobin (Hb) concentration (Ahmed and Ansari, 1989; Rhaman and Collines, 1990).

2.12. Treatment

Avermectins and milbemycins are animportant families of anthelmintics which are mostly used for the treatments of haemonchosis . Their mode of action is as positive allosteric modulators of ligand-gated chloride channels, and at higher concentrations, they gate some channels directly. Though it has long been known that the avermectins do not compete for the ligand binding site, the actual site at which they interact with their receptors has been unclear (Wolstenholme, 2010). Recent data demonstrate that importance drug binding of amino acid residues predicted to line a water-filled pocket in the channel domain. This pocket acts as binding site for anaesthetics and other modulators of mammalian GABA (A) and glycine receptors, suggesting similarities in the mode of action between these drugs and the avermectins/milbemycins (Wolstenholme, 2010).

The recently launched veterinary anthelmintic drench for sheep and goat containing the nematocide monepantel represents a new class of anthelmintics: the amino-acetonitrile derivatives (AADs). Monepantel is highly effective when administered to sheep at 2.5 mg/kg (Hosking *et al.,* 2010). Faecal egg counts were determined from several hours up to 14 days after treatment with monepantel, benzimidazoles, levamisole, macrocyclic lactones or combinations of the latter three classes. The treatment of susceptible isolates with effective anthelmintics, either as single or combined applications caused a reduction of FEC to 0 within 3-4 days. The status of the resistant nematodes could be confirmed, as treatment with the affected classical anthelmintics never resulted in complete absence of parasite eggs in all samples analyzed. In the case of multi-resistant isolates, only monepantel was able to stop egg excretion, while all other treatments resulted in partial reduction of FEC. The resistance status of the nematodes did not influence the rapid decline of egg counts after treatment with monepantel (Sager *et al*., 2010).

2.13. Control and prevention

The parasite gut provides a potential source of protective antigens. In fact, Substantial protection can be induced against *Haemonchus contortus* by immunizing lambs or goat kids with protein fractions isolated from the gut of this Parasite (Nayebzadeh*et al*., 2008). Young or susceptible animals are generally responsible for the vast majority of pasture contamination on a farm. Therefore contamination rates and parasitic disease may be reduced simply by reducing the proportion of young or susceptible stock on a farm this can be assisted by selling or removing young stock earlier, saving fewer replacements or changing the principle product of the operation, e.g. From lamb to beef. Obviously these sorts of decisions will be dictated largely by economic considerations. In a sheep finishing situation, the main aim is to minimize the larval challenge to the most vulnerable and economically sensitive class of stock, the naive lamb pre- and post weaning. In the case of goat farms, because all classes of animals tend to remain relatively susceptible to infection, reducing the proportion of susceptible stock will normally mean replacing a proportion of goat stock units with cattle (or less preferably adult sheep). Long term intensive farming of goats by themselves is unlikely to be viable due to difficulties in achieving adequate parasite control (Rattary, 2003).

3. MATERIALS AND METHODS

3.1. Study area

The study was conducted in Dangla at Awi administrative zone, Amhara national regional state and located 78 kms away from Bahir Dar town which is the capital city of Amhara rigion**.** The area lies between 11.3^{o} latitude and 36.8^{o} longitude with an elevation of 2,137 meters above sea level and the mean annual temperature and rain fall is 17c^{o} and1578mm respectively. Dangila is located on the northeast by the Mirab Gojjam Zone, on the southwest by Guangua, on the south by Faggeta Lekomam and on the northwest by Jawi woreda**.** Towns in Dangila include**,** Dangila, Addis Alem and Dek. The climatic condition is Woina Dega and characterized by moderate temperature and sufficient kiremit rainfall. According to the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), the total population settled in this woreda is 158,688. Among this 78,453 of them are women and 80,235 of are men, and 27,001 or 17.02% of the population are urban inhabitants. As records of Dangila Woreda Rural development and agricultural planning office the district has a livestock populations of cattle, 152,032(local) and 4,017 (cross), sheep (58,243), goats (19,659), mules (423), horses (564), donkeys (1,058), poultry (87,946) and bee colonies are kept in three categories of bee hives: traditional (1,050), transitional (135) and modern (868) bee hives.

3.2. Study population

The study animals were sheep and goats with different age, sex and body condition. The origins of these animals were from three randomly selected kebeles of Dangila district. A total of 384 animals of sheep (n=296) and goats (n=88) were randomly selected and examined. The ages of animals were determined using owners' information and dentition (Gatenby). Accordingly, animals were categorized as young ($\leq$ 2 years) and 2-4 and adults ($\geq$ 4 years) (Gatenby). And the body condition of animals were grouped as good, medium and poor (Cooper and Thomas,.1982)

3.3. Study design:

A cross-sectional study design was used to estimate the prevalence of haemonchus infection in sheep and goats in the study area. A simple random sampling technique was used to select kebeles and study animals. The sample size was determined using the formula given by Thrusfield (2005) with a 50% expected prevalence, a 5% desired absolute precision and 95% confidence interval

3.4. Sampling and Coprological examination:

A total of 384 faecal samples were collected directly from the rectum of each study animal using disposable glove. The collected samples were properly labeled with the necessary information and transported to the respective veterinary clinic immediately. The floatation technique was employed to concentrate parasite eggs in the faeces and examined microscopically for presence of haemonchus eggs on the basis of their morphology (Kumsa., 2007).

3.5. Sample size determination

The desired sample size was calculated using the standard formula described by Thrusfield (2005). Since there was no previous work done on this area, the expected prevalence is 50%, the minimum sample size at 95% confidence interval and at 5% precision or accuracy level the sample size is calculated to be 384 using the formula.

$$n = \frac{1.96^2 \text{Pexp}(1 - \text{Pexp})}{d^2}$$

Where: n = sample size;

P^{exp} = minimum expected prevalence = 50%

1.96 = the value of z at 95% confidence interval

d = desired accuracy level at 95% interval.

3.6. Data management and analysis

The data was checked, coded and entered in to Microsoft excel work sheet and analyzed using SPSS software version 16.0. Descriptive statistics was used to express prevalence while chi-square χ2- test was used to compare as haemonchus prevalence rate with sex, age, body condition, species as well as place of origin.

4. RESULT

Out of the total numbers of 384 sheep and goats examined, 204 were infected and the overall prevalence of haemonchosis were 53% (204/384).The infection rates of haemonchosis in female and male small ruminants were 48% (74/153) and 56% (130/231) respectively, which reveals as there is no significant difference observed (χ^2=313, p=0.128). In addition, among 296 sheep examined, the infection rate was 55% (164/296) whereas, in goats the infection rate was 45% (40/88) from the total numbers of 88 goats examined (table2).

Even though there was high infection rate recorded in sheep (55%), the infection rate was no statistically significant (χ^2=3.53, p=0.171) difference observed. On the other hand, the prevalence of haemonchosis in different body conditioned animals were 53%, 58% and 48% in medium, poor and good body conditioned animals respectively. However, there was statistically insignificant (χ2=2.43, p=0.297) difference observed among the three body condition categories. The occurrence of haemonchosis was also more frequently recorded in those animals $\leq$ 2 years and 2- 4 years, and their prevalence rate was 62% and 58%, respectively than those animals which are $\geq$4years and prevalence rate of 41%. Moreover, there was significant difference (χ2=13.198, p=0.001) observed in the three age groups (table3).

Concerning on the prevalence of haemonchosis in different places of origin, there was high rate of infection in kuandisha (62%) in relative to Girargae (49%) and Ganga (48%), (table 5). The infection rates of small ruminant species was statistically significanct in relation to place of origin (χ^2=6.88, p=0.033).

Table 1: Prevalence of haemonchosis based on sex

Sex	No of positive	No of negative	Total	Prevalence (%)
Female	130	101	231	56%
Male	74	79	153	48%
Total	**204**	**180**	**384**	**53%**

χ^2=2.313, p=0.128

Table 2: The Prevalence of haemonchosis in relation to species

Species	No of Positive	No of Negative	Total	Prevalence (%)
Sheep	164	132	296	55%
Goat	40	48	88	45%
Total	**204**	**180**	**384**	**53%**

χ^2=3.536, P=0.171

Table 3: The Prevalence of haemonchosis based on age category

Age	No of Positive	No of Negative	Total	Prevalence (%)
$\leq$2	81	50	131	62%
2-4	63	45	108	58%
$\geq$4	60	85	145	41%
Total	**204**	**180**	**384**	**53%**

χ^2=13.198, p=0.001

Table 4: The Prevalence of haemonchosis based on body condition

Body condition	No of positive	No of Negative	Total	Prevalence (%)
Good	50	55	105	48%
Medium	70	63	133	53%
Poor	84	62	146	58%
Total	**204**	**180**	**384**	**53%**

χ^2=2.43, P=0.297

Table 5: The Prevalence of haemonchosis in relation to place of origin

Place/Origin	No of positive	No of Negative	Total	Prevalence (%)
Grarigae	47	49	96	49%
Ganga	64	68	132	48%
Kuandisha	97	59	156	62%
Total	**208**	**176**	**384**	**53%**

χ^2=6.88, p=0.033

5. DISCUSSION

The study was conducted from November 2014 to April 2015 in Dangila district to examine the prevalence rates and associated risk factors of haemonchosis in small ruminants. The overall prevalence of haemonchus parasites in the 296 sheep and 88 goats were 53%, with 45% (40/88) in goats and 55% (164/296) in sheep across the three different locations. There was no statistically significance difference ($P>0.05$) between the two small ruminant species; this reveals that they are equally susceptible to haemonchosis. In goats the prevalence of haemonchosis was higher in males compared to females, while in sheep the opposite was observed. Normally, females are assumed to be more heavily infested due to hormonal differences and stress during pregnancy. In goats the present results may be due to the stall feeding of female animals during pregnancy, which reduces exposure to pasture contamination (Pal and Qayyum, 1992; Maqsood *et al*., 1996; Ayaz *et al*., 2013).

The overall infection rate of haemonchosis (53%) in the present study area was lower than the previous studies conducted in different areas of Ethiopia. For example, in East shoa Melikamu (1991) reported 96.43% prevalence in sheep and 94.52% in goats, Esayas (1999) and Bersisa (2004) reported 95.6% and 90.78% in sheep and 100% and 96.55% in goat in Eastern Ethiopia, Bayou in Wollega recorded prevalence of 88.2%, Solomon 93.6 % in the Ogaden region, Wossene 91.2% in sheep and 82.9% in goats of Ogaden region. This variation in prevalence of haemonchosis in small ruminants may be due to the differences in agro-ecology, management practices, season, sample size, services of veterinary infrastructure, seasonal de-worming, increment the awareness of people attention to the animal and genetic improving of the animal.

The present study noted that prevalence was higher in animals less and equal to two years than above four years old. These results are closely related to the findings of Assoku, (1981); Gibbs, (1986); Asanji and Williams, (1987); Pal and Qayyum, (1992); Maqsood *et al.,* (1996); Vlasoff *et al.,* (2001); Magona and Musisi, (2002); Vanimisetti *et al.,* (2004); Lateef *et al.,* (2005). The effect of age on faecal egg counts was highly significant ($P<0.01$). Maqsood *et al.,* (1996) reported that the prevalence of *haemonchosis* was higher in both sheep and goats less than two years of age (67.1%; 47.8%) compared with those of above four years (40.4%; 33.3%). (Tariq *et al.,* 2010; Zeryehun, 2012) reported that older animals recover from parasitic infection more quickly as the immunity of the host increases with age; animals may hence become immune, especially as they undergo repeated exposure (Dagnachew *et al*., 2011). It was recognized that sheep below or equal to two years of age are more susceptible to parasite infection than above four years of age, Gamble and Zajac, (1992); Watson *et al.* (1994) and Colditz *et al.*,1996). This may be due to the fact that with the advancement of age, vigor of the animal becomes better and they develop resistance against the parasitic diseases (Silverman and Patterson, 1960). The overall prevalence of 53% reflects the importance of these blood sucking parasites in Dangila. This is still very low compared to the prevalence reported in other countries: 82% in Togo (Bonfoh et al., 1995); 94% in Middle Guinea (Barry *et al*., 2002) and 60% in Eastern Ethiopia (Sissay, 2007). Lower prevalence has also been reported elsewhere (Tariq *et al*., 2010; Dagnachew *et al*., 2011; Qamar *et al*., 2011).

The results of the present study was in line with 55% in sheep and 45% in goats and this report indicates how much the parasite is highly significance in case of prevalence, pathogenesity, its biotic potential, ability of anthelmintic resistance, unique survival strategy due to considerable biological and ecological plasticity (Hypobiosis and self-cur phenomena) and economically most important nematode with the ability of causing losses in most classes of animals. In general it is the most economically important nematode in the study area with the ability of causing effect on the health as well as the productivity of small ruminants, in addition to these the parasite has developed resistance for commonly used antihelmenthics and cause challenges for small ruminant rearing. Presence of sufficient rainfall and moisture areas favored the survival of infective larvae in pasture and higher probability of uptake of the infective larvae leading to higher prevalence rate. Relationship between body condition poor (58%),medium (53%) and good (48%), and haemonchosis in sheep and goats was recorded and no statistical difference between medium, poor and good body conditioned animals which means all animals that have been different body conditioned were equally susceptible for haemonchosis which agrees with Regassa *et al*. (2006). However, it disagrees with previous reports by Tasawar *et al.*, (2010). This could be explained by the fact that loss of body condition in the study animals could be due to other factors, such as seasonal change of forageable feed staff and the presence of other concurrent diseases.

During the study period, the highest prevalence of haemonchosis was recorded in those animals brought from Kquandisha (62%); while the lowest prevalence was recorded in the animals that brought from Grarigae (49%) and Ganga (48%). This might be due to the environmental factors such as temperature and humidity that facilitates the distribution of the parasite to the grazing pasture because of the geographical area which is easy predisposing with flood especially during the rainy season. This study showed the occurrence of infection of small ruminants of the area by abomasal nematodes suggesting the existence of pasture contamination and the availability of infective larvae during months of the study period

6. CONCLUSION AND RECOMMENDATION

The results of the current study indicated that haemonchosis is a prevalent disease in study area and is an important health problem of the sheep and goats which are speculated to cause heavy economic losses through low performance and short life expectancy of working small ruminant. These nematode parasites are more prevalent and familiar helminthes in the study area and have significance role in the life system of developing countries especially in Africa, particularly for consumption as well as exportation.

Based on the above conclusion the following recommendations were forwarded:

- Commercially available anthelmintics should be used according to deworming schedule.
- Well organized parasitic control measure and management system should be employed
- Education and awareness creation of community with regards of economic significances and epidemiology of haemonchosis on small ruminants should be given special attention.
- Use of isolated grazing system for different age group as well as host species, and use of rotational grazing system as in case of haemonchus control should be applied.
- Pasture and herd management practices should be improved.
- Alter the pasture grazing with a short duration crop such as alfalfa in order to break the life cycle of *H. contortus*.
- Provide high nutrition diet to pregnant sheep and goats which will boost up their immune response against parasites

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8. ANNEXES

8.1. Annex1

Laboratory procedure

i. Fecal samples were processed using floatation method according to the procedure described in Hansen and Perry, 1994. The procedure in brief is: 3gms of fecal sample are suspended in 20-50 ml of water. The mixture then strained through plastic sieve in to centrifuge test tube
ii. The mixture is centrifuged to sediment
iii. The supernatant fluid is discarded
iv. Floatation fluid is added into the test tube until slight convex meniscus formed at the top
v. Then the cover slips is placed on the top of the tube, making sure no air bubbles are present and allow to stand for 20-30 minutes
vi. Remove the cover slip and place on the slide and examine under the microscope starting with lower magnification power (4x and 10x) Source (Hansen and Perry, 1994)

8.2. Annexes 2

Body condition scoring method

Condition score	Description
Poor	Bone of the neck and shoulder easily noticeable. ribs very visible, spines process prominent, the eye muscle area has moderate depth and animal extremely emaciated,
Medium	Neck and shoulder are not obviously thin, Ribs just visible, the spines process can be felt with very firm pressure and rounded rather than sharp. The eye muscle areas full with moderate fat.
Good	Neck and shoulder become round, Ribs not visible but easily felt and Back or top line level, the eye muscles area were full and have a thick fat cover and the ribs are fully covered by flesh

(Cooper and Thomas, 1982)

8.3. Annexes 3

Estimation of Age of Sheep and Goats

Permanent incisors	Ages of sheep
Non	Less than one year and three months
One pair	One year and three months to one year to ten months
Two pair	One year and ten months to two year and four months
Three pair	Two year and four months to three year and four months
Four pair	More than three year

Sources: Gatenby, 1995

Teeth	Classification of ages of goats
Eight sharp incisor	Under one year
Central pairs of baby teeth replaced by permanent teeth	One up to two year
Four permanent teeth	Two up to three year
Six permanent teeth	Three up to four year
Eight permanent teeth	Four up to five year
Worn teeth and same missing	Over five year

Source: Steele, 1996

8.4. Annexes 4

Geographical location of Dangila woreda

9. DECLARATION

I, the under signed, declare that the information presented here in my thesis is my original work, has not been presented for degree in any other university and that all sources of materials used for the thesis has been duly acknowledged

Name: GETANEH ENDALEW YAZIE

Signature: ___________________

Dates of submission: _ _____________

This thesis has been submitted for examination with my approval as university advisor.

Name:___________________________________

Signature:___________________________________